

## II. REMARKS

### Preliminary Remarks

The applicants would like to thank the examiner for the indication of allowable subject matter in claims 3, 10, 14, 15, and 19 to 23.

Upon entry of this Amendment, claims 1 to 26 will be pending, of which claim 1 is independent. Claims 1 to 26 are amended and claims 25 and 26 are added. Support for the claim amendments and the new claims can be found in the specification and claims as filed (see, for example, page 9, first paragraph; and page 20, second paragraph). The applicants believe that no new matter is added.

This response is filed within the shortened statutory period for response, no fee due. The response is accompanied by an authorization to charge our deposit account for the fee required for the additional claims. The applicants respectfully request reconsideration and allowance of the present application.

### Patentability Remarks

#### *Rejection under 35 U.S.C. §112 –*

Claims 1 to 18 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. The applicants respectfully traverse in view of the preceding claim amendments and succeeding remarks:

- Claims 1, 10, 13, and 19 are amended to remove the narrower limitations;
- Claims 5 to 8, 13, 19, and 20 are amended to delete the terms “preferably”, “more preferably”, “for example”, and “i.e.”;
- The Markush groups of claims 7, 8, 9, 11 are amended to the proper format;
- Claim 15 is amended to delete the phrase “the amorphous ones being different from the ionomer used in the membrane”;
- Claim 1 is amended to delete the phrase “the hydrophilic group”.

The applicants respectfully submit that these claim amendments render the rejection under 35 U.S.C. §112, second paragraph, moot and request its withdrawal.

*Rejection under 35 U.S.C. §101 –*

Claims 17 and 18 were rejected under 35 U.S.C. §101 as claiming the recitation of a use, without setting forth any steps involved in the process. The applicants respectfully submit that this rejection is moot in view of the preceding claim amendments and succeeding remarks.

While not necessarily agreeing with the examiner's rejection, the applicants have amended claims 17 and 18 to, *inter alia*, a method of separating utilizing the membranes according to claim 1. This claim format is in accordance with the Manual of Patent Examining Procedure (M.P.E.P. §2173.05(q)) and the applicants respectfully request withdrawal of this rejection.

*Rejection under 35 U.S.C. §103 –*

Claims 1, 2, 4, 5 to 9, 11, 12 and 16 to 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over Mallouk *et al.* (U.S. Pat. No. 5,082,472). The applicants respectfully traverse in view of the preceding amendments and succeeding remarks.

The present invention is directed to hydrophilic membranes having better permeation to water, in comparison with the prior art, but which are not susceptible to dewetting. Dehydration of the membrane causes loss of hydrophilicity. Membranes must undergo complex rehydration procedures in order to regain hydrophilicity. Membranes which do not exhibit dewetting, however, hydrate easily with they come in contact with water. This is shown by the fact that the membrane becomes transparent.

The applicants have found porous hydrophilic membranes as claimed, which solve this technical problem. The membranes claimed in the present invention have a water permeability higher than 1 liter/(h.m<sup>2</sup>.Atm) and do not show the dewetting phenomenon.

Examples 1 to 11 of the present application show that the membranes of the present invention have a water permeability higher than 1 liter/(h.m<sup>2</sup>.Atm), as shown in the following table. This table also shows that, as a general trend, increasing the amorphous ionomer content (up to 60% wt. to 65% wt. in a membrane) decreases the water permeability.

Water permeability of the membranes of the invention vs. EW and ionomer content (% by weight)			
Water permeability liter/(h.m <sup>2</sup> .Atm)	EW g/eq.	ionomer content % wt.	reference (from specification)
2042	461	8	Example 2, page 28
241	588	16	Example 4, page 31
14	524	29	Example 7, page 36
10	588	33	Example 5, page 33
1.5	499	60	Example 11, page 41
2	524	65	Example 8, page 37
4	524	75	Example 9, page 38

Comparative Example D on page 44 of the specification discloses a non-crosslinked membrane on a porous PTFE support, having the following features:

- it contains 4.7% wt. of an ionomer with 10.2% crystallinity;
- it shows the dewetting phenomenon since the membrane is white at the dry state and it does not become completely transparent when in contact with water (page 46, lines 19 to 20); and
- the permeability to water is 0.2 liter/(h.m<sup>2</sup>.Atm).

A comparison of this permeability value with that of the membrane of Example 2 according to the present invention (which has the closest ionomer content - 8%), shows that the water permeability of the comparative membrane is about 10<sup>4</sup> times lower than that of a membrane of Example 2, *i.e.*, the comparative membrane is much less permeable to water. One of ordinary skill in the art would have expected the opposite, namely that the water permeability of Comparative Example D would have been higher than that of the membrane of Example 2 since Comparative Example D contains less (4.7%) amorphous ionomer (versus 8% wt. of Example 2).

Further, the difference in water permeability between membranes containing semi-crystalline and amorphous ionomers is shown in comparative Example F and Example 8. Comparative Example F (page 49) discloses a membrane containing 66% wt. of an ionomer having a crystallinity of 23.2%. This membrane does not show any

detectable permeability to water. In contrast, the membrane of Example 8 (page 37), which contains an amorphous ionomer, and has nearly the same ionomer content as that of Example F (65%), shows water permeability (2 liter/(h.m<sup>2</sup>.Atm)).

These examples show that membranes containing amorphous ionomers, as opposed to partially crystalline ionomers, show the absence of the dewetting phenomenon and an improved water permeability, *i.e.*, higher than 1 liter/(h.m<sup>2</sup>.Atm) as claimed.

Mallouk *et al.* disclose a dimensionally stable, composite membrane of a microporous film in laminar contact with a continuous perfluoro ion exchange resin layer (see column 6, lines 20 to 22). These membranes are used in the facilitated transport separation of acid gas from a hydrocarbon stream (see Abstract). Example IV in column 17 describes a gas permeability experiment wherein pure carbon dioxide was used.

One of ordinary skill in the art, upon reading the disclosure of Mallouk *et al.*, would understand that the composite membranes described are impermeable to fluids that are not gases. In other words, the Mallouk *et al.* membranes are impermeable to water. There is no teaching or suggestion in Mallouk *et al.* of membranes permeable to water, and which not dewetted.

Furthermore column 12, lines 66 to 68 of Mallouk it is stated that the surfactant and salts, if desired, can be applied with the polymer solution to expanded PTFE (EPTFE) to facilitate rewetting after drying (*i.e.*, the membrane undergoes dewetting).

In contrast, the membrane of the present invention (see Example 2, page 28 of the specification) does not show the dewetting phenomenon even though the porous PTFE is impregnated with an organic solution containing only the ionomer, *i.e.*, without any additive of the surfactant or salt type.

Finally, there is no motivation in Mallouk *et al.* of amorphous ionomers as opposed to crystalline ionomers for the porous support.

In conclusion, the applicants respectfully submit that claims 1, 2, 4, 5 to 9, 11, 12 and 16 to 18 are not unpatentable over Mallouk *et al.* and request withdrawal of this rejection.


## II. CONCLUSION

In view of the amendments and remarks above, the applicants respectfully submit that this application is in condition for allowance and request favorable action thereon.

In the event this response is not timely filed, the applicants hereby petition for an appropriate extension of time. The fee for this extension, along with any other additional fees which may be required with respect to this response, may be charged to Deposit Account No. 01-2300, referencing Attorney Docket No. 108910-00053.

Respectfully submitted,

ARENT FOX PLLC

  
Gautam Prakash, Ph.D.  
Registration No.: 53,481  
Direct Telephone No.: 202-857-6057

Customer No.: **004372**

1050 Connecticut Avenue, N.W.  
Washington, D.C. 20036-5339

Telephone No.: 202-857-6000  
Facsimile No.: 202-638-4810

GP/ccd